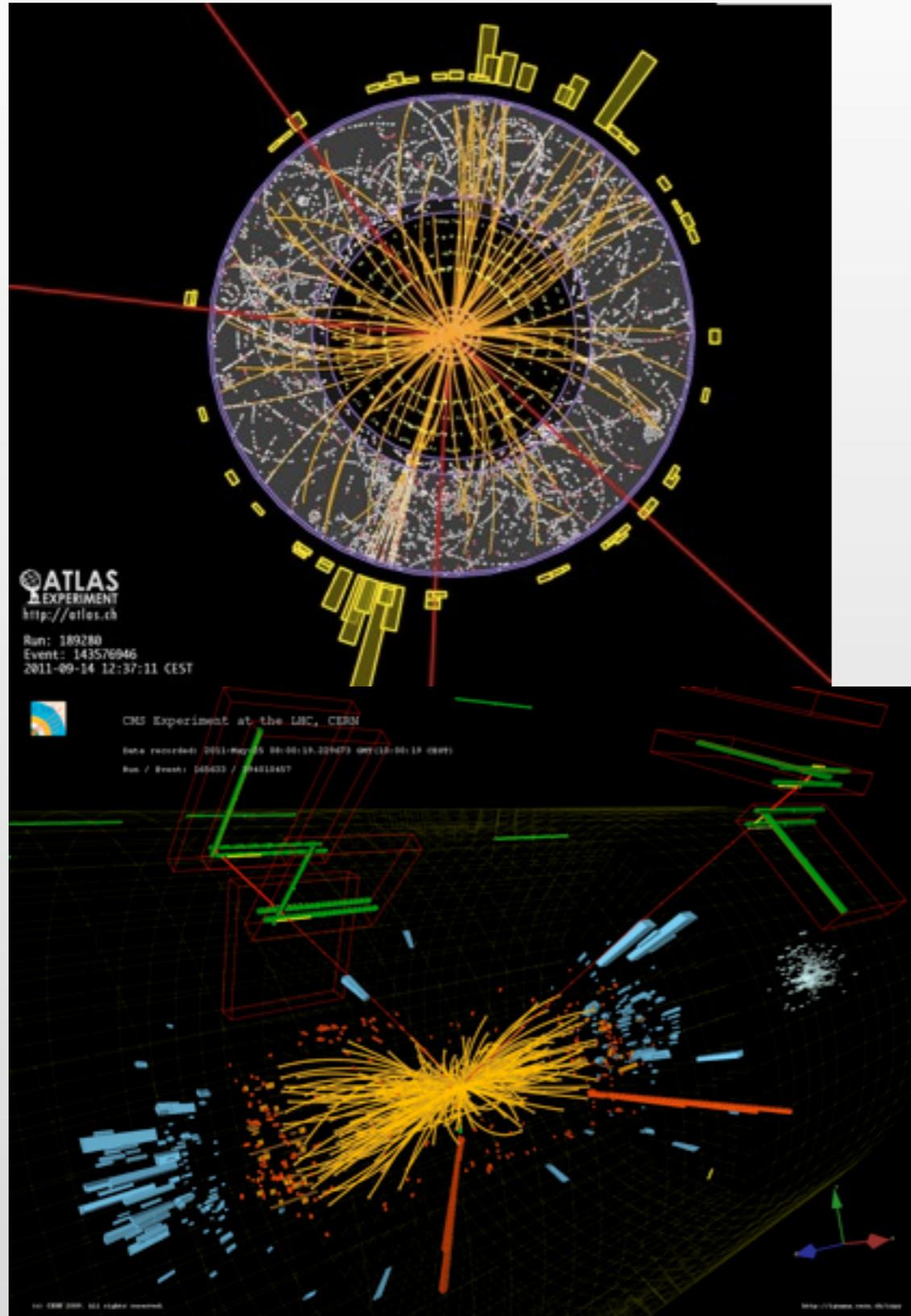
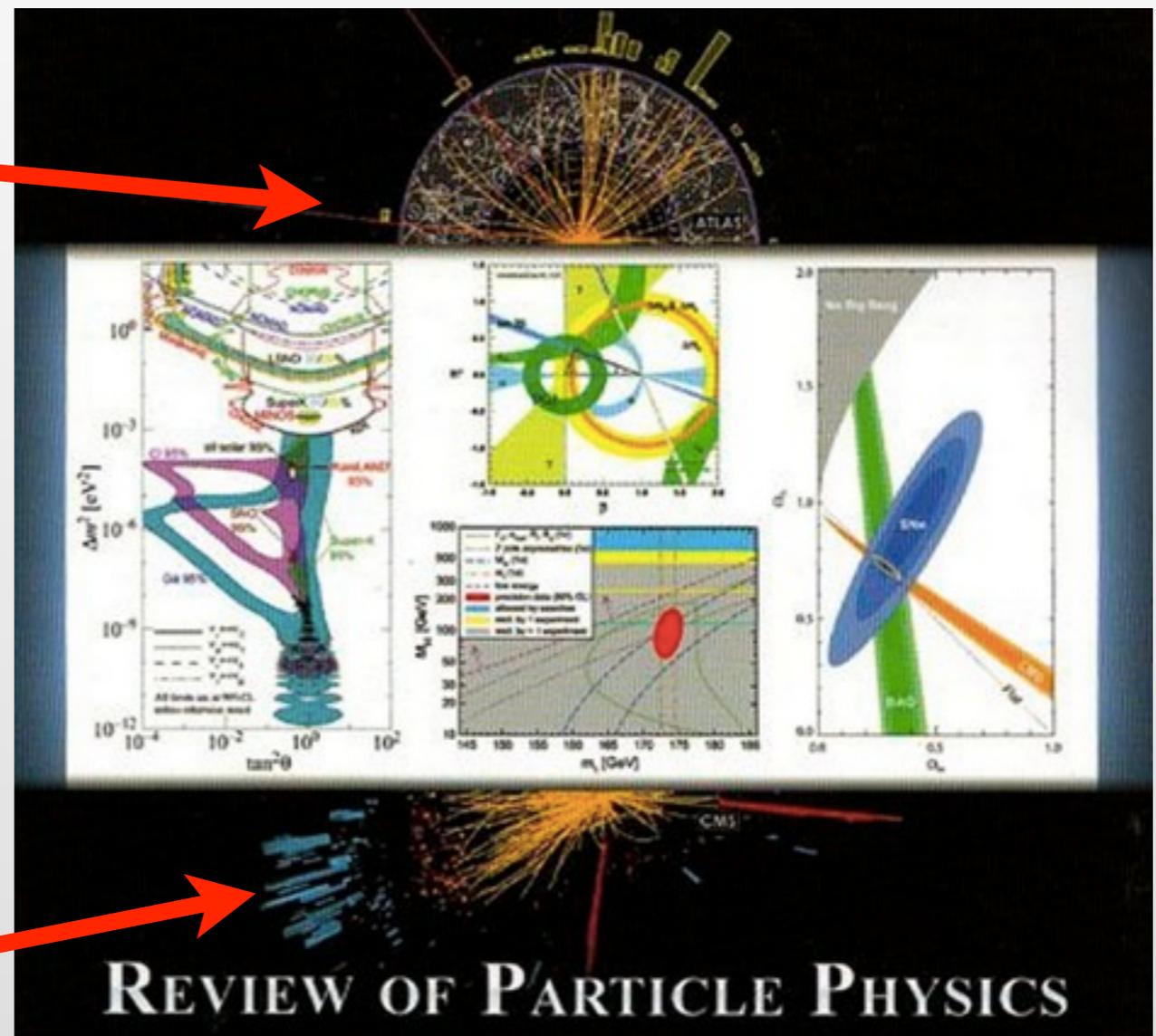
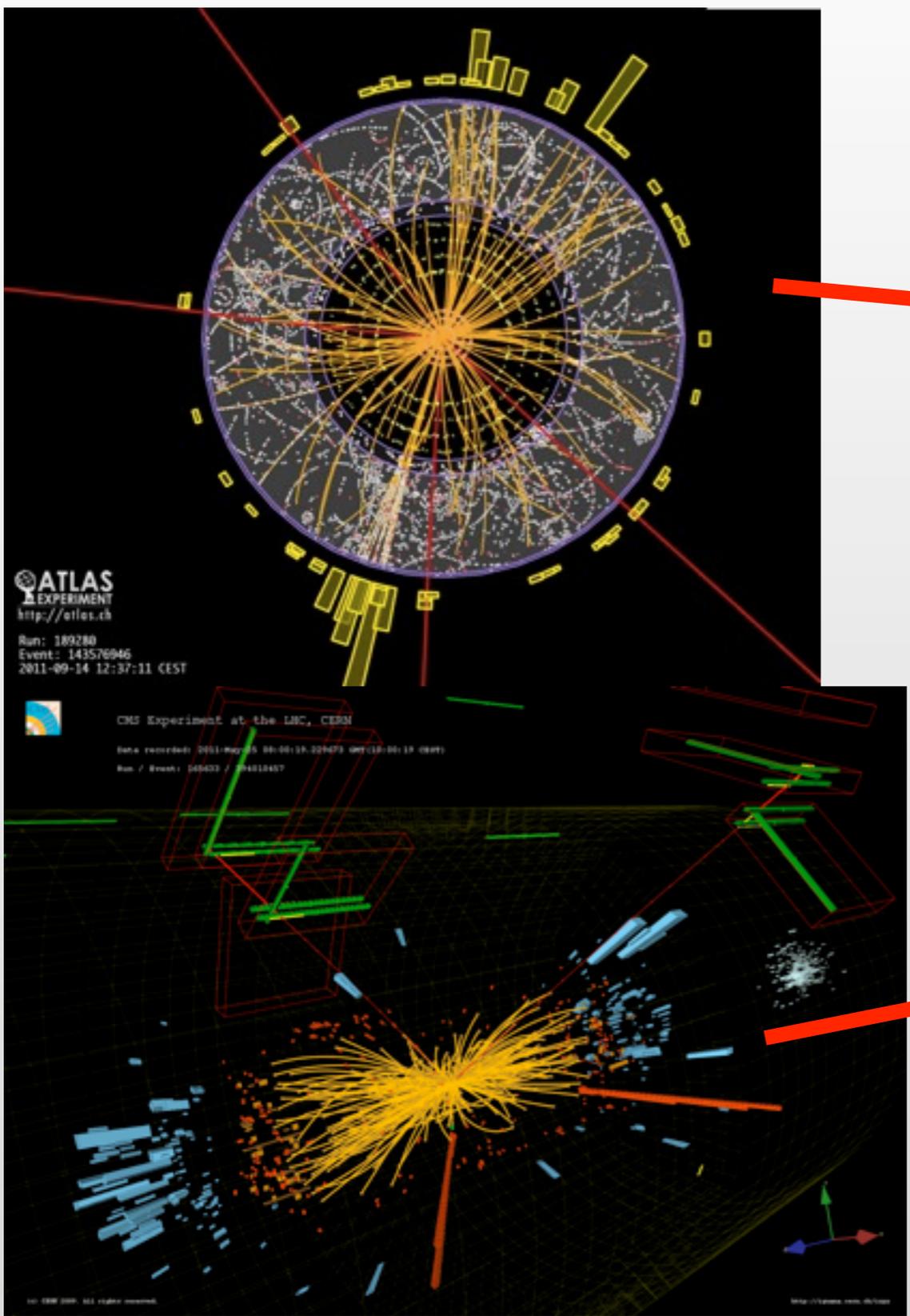


LHC Searches, Limits, Anomalies, Discoveries

Katherine Copic
October 7, 2012





ATLAS and CMS Higgs candidates

<u>Papers</u>	<u>2008</u>	<u>2010</u>	<u>2012</u>
Supersymmetry	33	34	68
Axions	18	21	21
Higgs	12	34	51
W', Z'	18	16	36
Compositeness	6	5	12
Extra dimensions	11	10	17
Other searches	4	12	37
Free q, monopoles	1	3	2
	103	135	244

Beringer (LBNL) - free quark searches
de Gouvea (Northwestern) - SUSY
Groom (LBNL) - Gravitons
Hikasa (Tohoku) - Higgs, WIMPs, Misc.
Gherghetta (Melbourne) - Extra Dimensions
Hagiwara (KEK) - b'/t' searches
Milstead (Stockholm) - monopoles
Olive (Minnesota) - Axions, SUSY, Extra dim.
Pape (ETH Zurich) - SUSY
Piepke (Alabama) - Axions
Takahashi (Tohoku) - Axions
Tanabashi (Nagoya) - Heavy Bosons, Technicolor
Vogel (Caltech) - Axions

**These encoders'
careful work is
the foundation of
all the listings in
the book!**

Balance between theorists & experimentalists,
ATLAS, CMS, CDF, D0, LHCb, BaBar, BELLE, etc.

Not covered in the rest of this talk:

Axions: [G.G. Raffelt \(MPI Munich\)](#) & [M. Barnett \(LBNL\)](#) – some revision to
remove overlap with Higgs section – See K. Hikasa's talk

Compositeness: [J. Terning \(UC Davis\)](#) & [M. Barnett \(LBNL\)](#) – first LHC papers!

Review authors: [K. Hagiwara \(KEK\)](#), [K. Hikasa \(Tohoku\)](#), [M. Tanabashi \(Nagoya\)](#).

Fourth Generation Quarks: [W.M. Yao \(LBNL\)](#) – first LHC papers!

Technicolor: [J. Terning \(UC Davis\)](#) & [M. Barnett \(LBNL\)](#) – review updated, 2012

Review authors: [R. S. Chivukula \(Michigan State\)](#), [J. Womersely \(STFC, RAL\)](#)

WIMPs: [K. Hikasa \(Tohoku U.\)](#) & [W.-M. Yao \(LBNL\)](#) – See K. Hikasa's talk

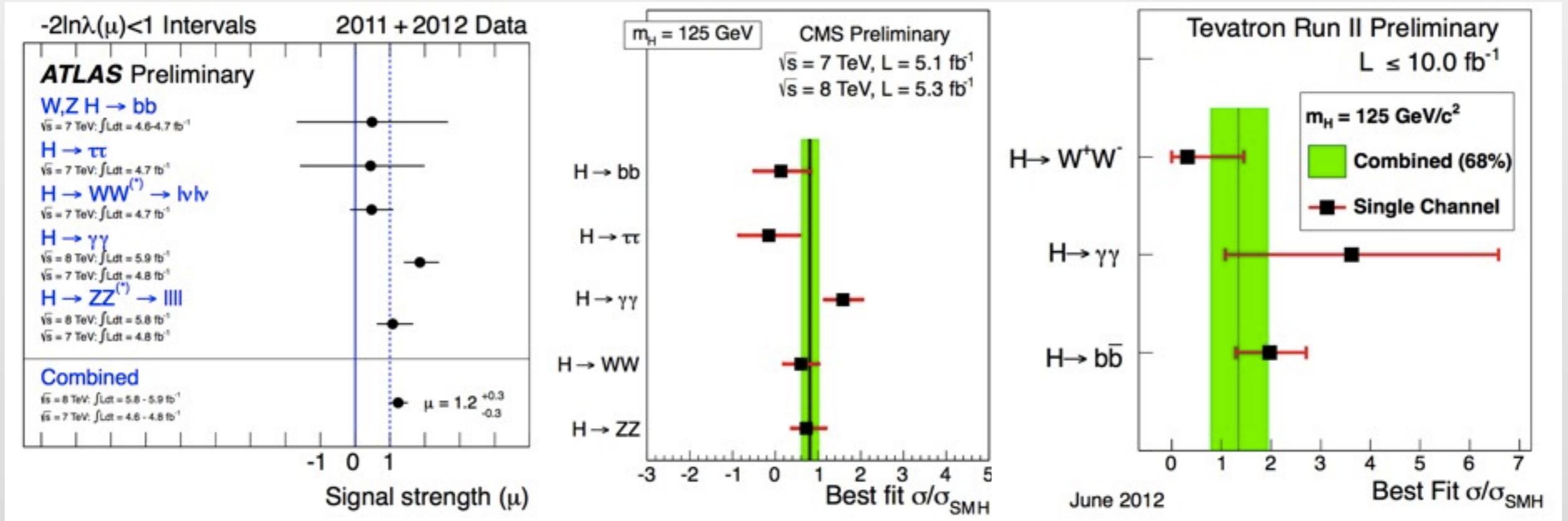
In summary, a new particle has been observed at the LHC.

Higgs Bosons — H^0 and H^\pm , Searches for

The July 2012 news about Higgs searches is described in the addendum to the Higgs review in the data listings, but is not reflected here.

The book was updated just before publishing to include the latest results.

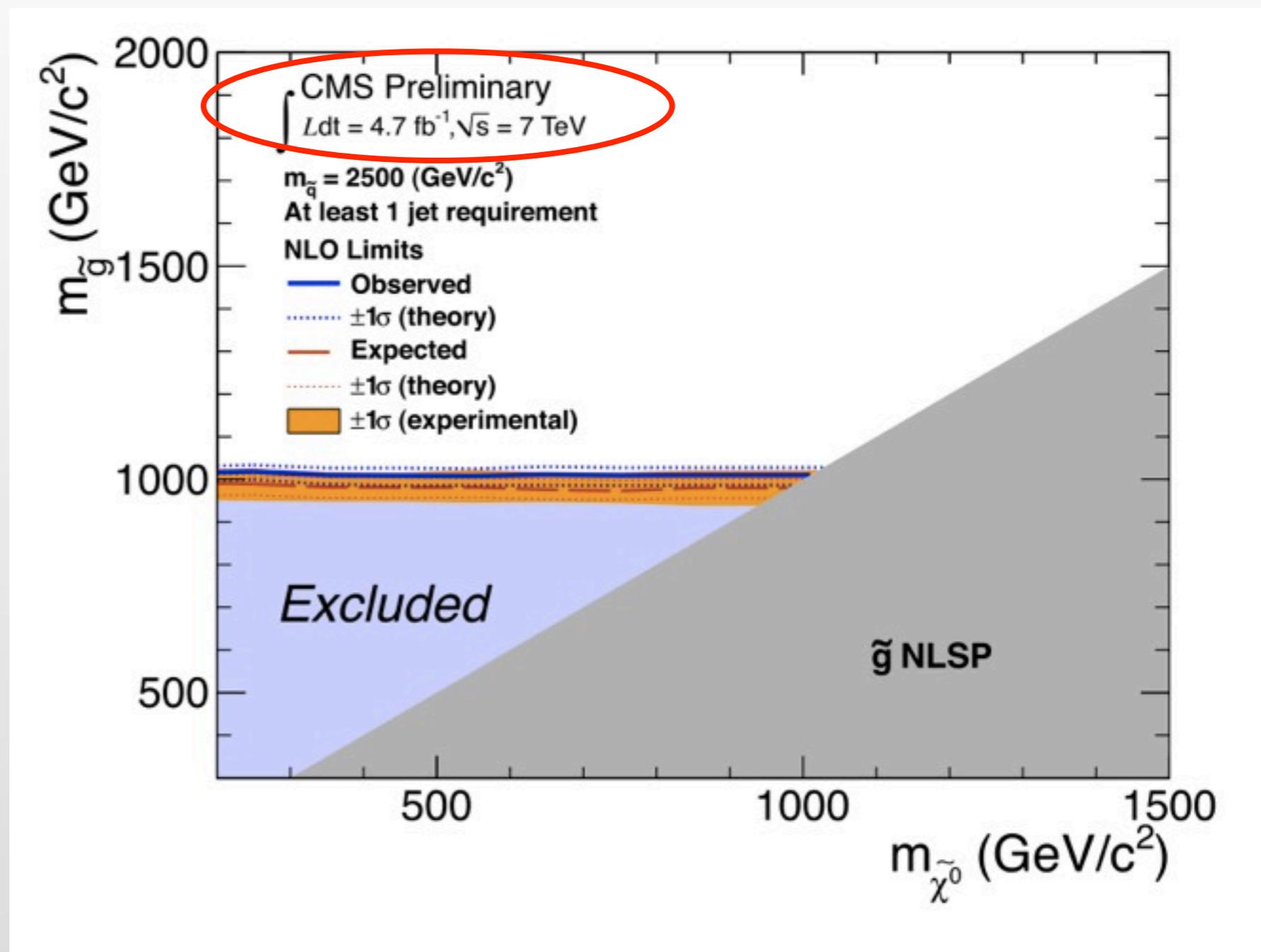
See upcoming [Listings Talk](#) and [Review talk](#) for details.



2012 Responsible: Michael Barnett (LBNL)

**Tons of new
SUSY results!**

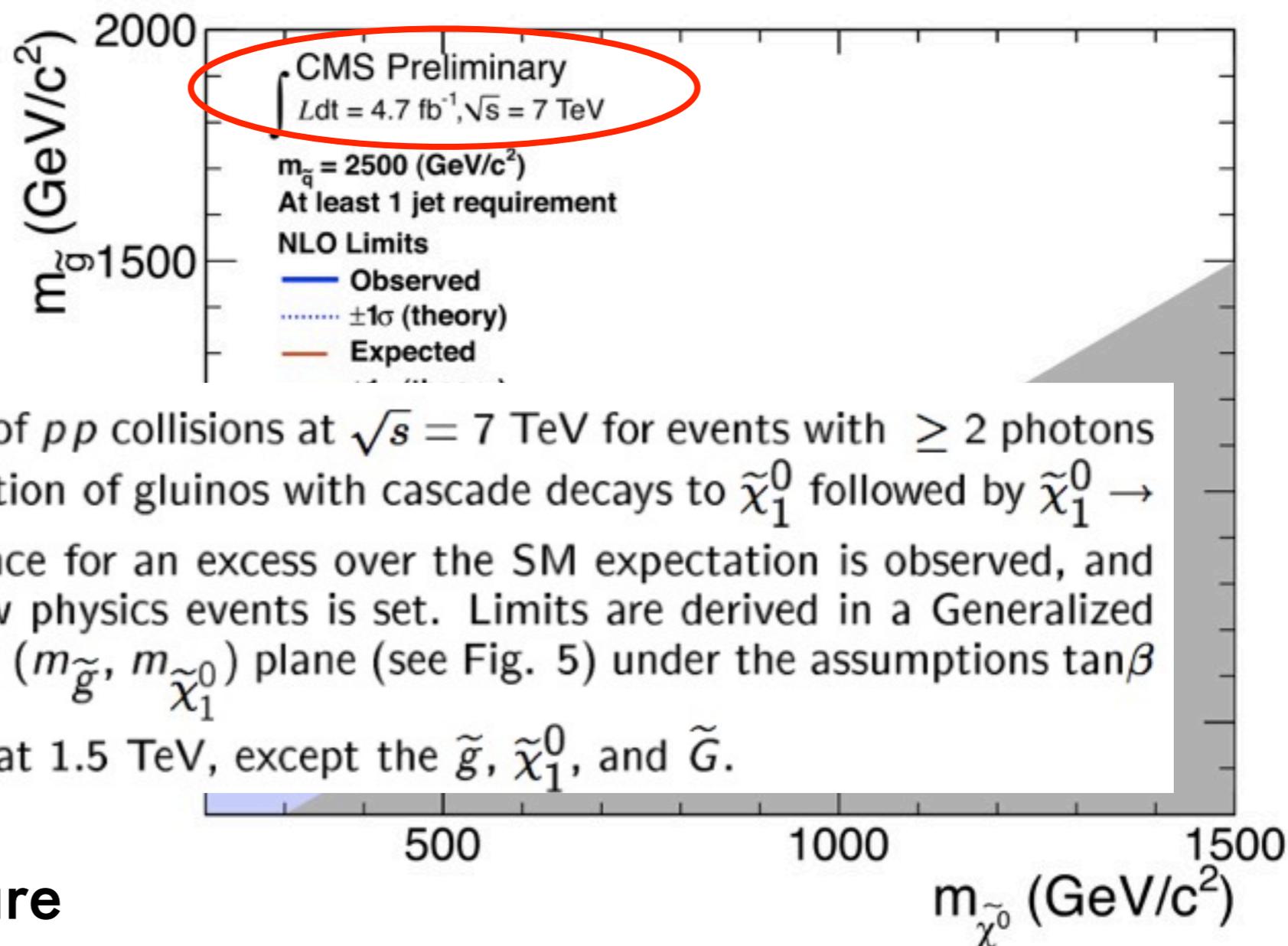
M. Barnett talk has
more detail: [\(link\)](#)



2012 Responsible: Michael Barnett (LBNL)

Tons of new SUSY results!

M. Barnett talk has more detail: [\(link\)](#)



¹⁴ AAD 11X looked in 36 pb^{-1} of pp collisions at $\sqrt{s} = 7 \text{ TeV}$ for events with ≥ 2 photons and \cancel{E}_T from the pair production of gluinos with cascade decays to $\tilde{\chi}_1^0$ followed by $\tilde{\chi}_1^0 \rightarrow \gamma \tilde{G}$ prompt decay. No evidence for an excess over the SM expectation is observed, and a limit on the number of new physics events is set. Limits are derived in a Generalized Gauge Mediated model in the $(m_{\tilde{g}}, m_{\tilde{\chi}_1^0})$ plane (see Fig. 5) under the assumptions $\tan\beta = 2$ and all sparticle masses at 1.5 TeV, except the \tilde{g} , $\tilde{\chi}_1^0$, and \tilde{G} .

Lots of work to compare apples to apples

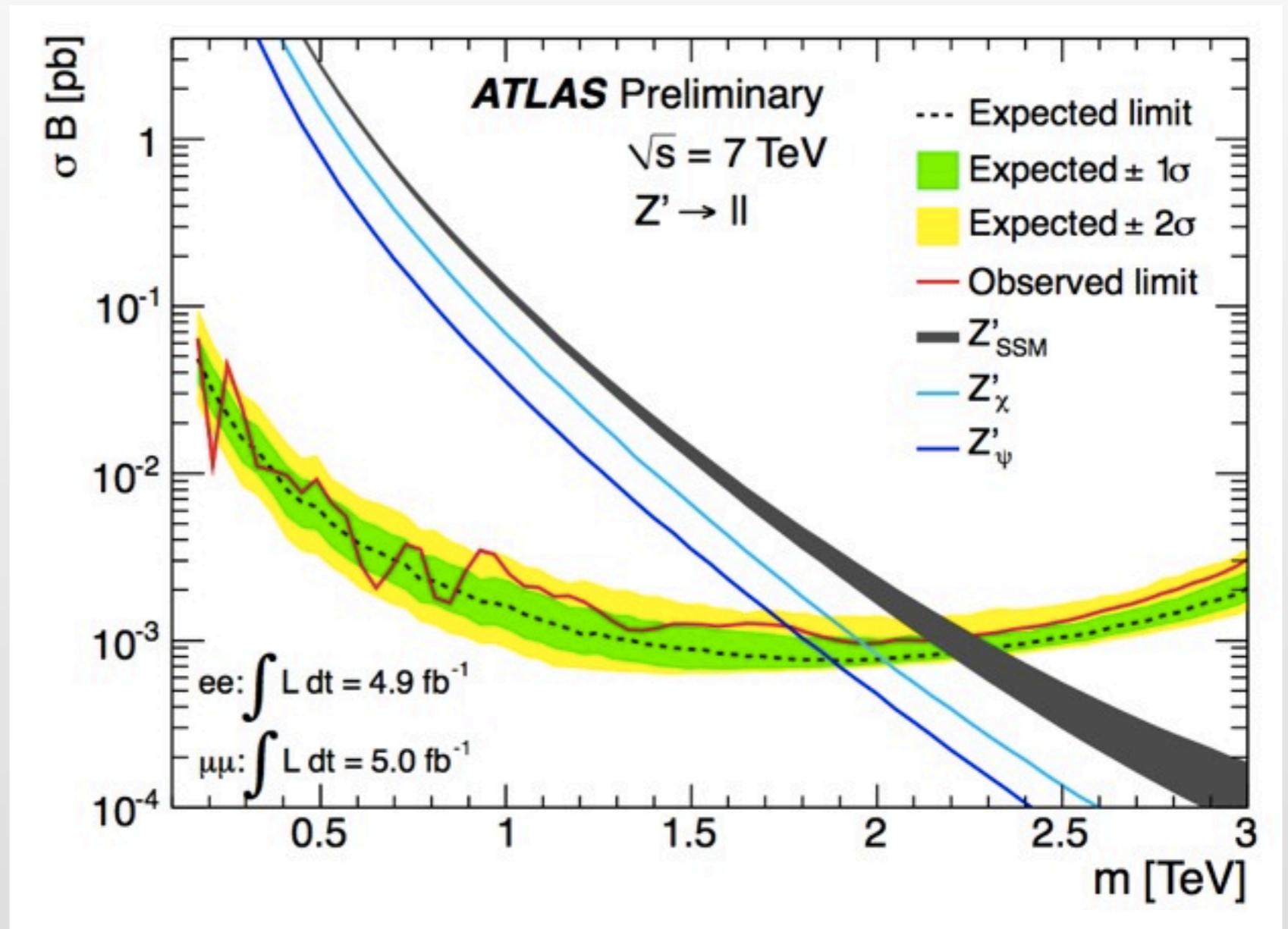
2012 Responsible: Michael Barnett (LBNL)

W' and Z' Reviews

G. Brooijmans (Columbia)
 M.-C. Chen (UC Irvine)
 B. A. Dobrescu (Fermilab)

Latest Preliminary results included in both sections' reviews, with data through Moriond.

Both W' and Z' excluded up to ~2 TeV



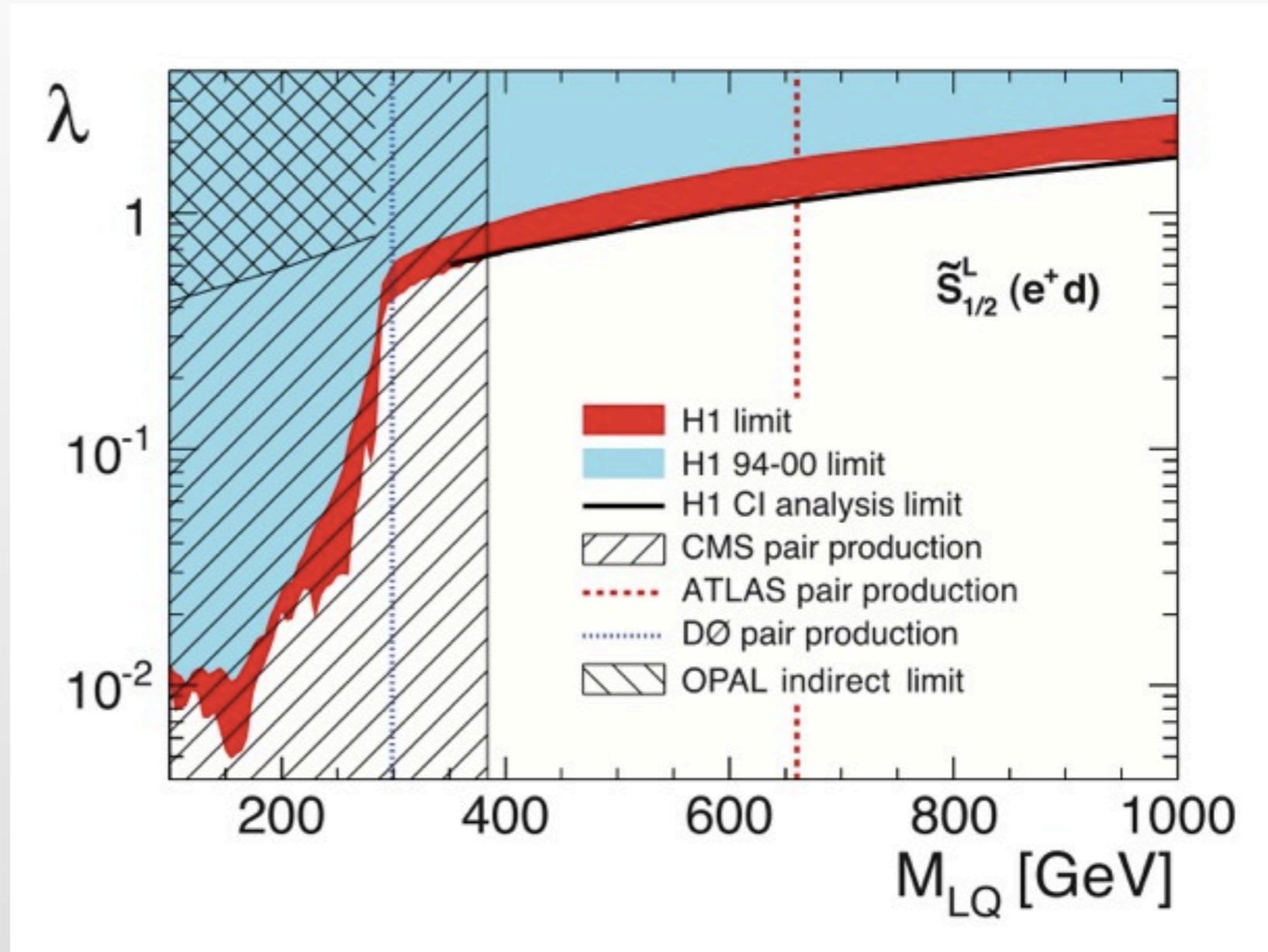
2012 Responsible: KC

Leptoquark Review:

S. Rolli (US Dept. of Energy)

M. Tanabashi (Nagoya U.)

Latest Preliminary results included in book, with figures made specifically for this review.



★ W' , Z' , Leptoquarks used new encoding system described later [by Juerg](#) for 2012 book

2012 Responsible: KC

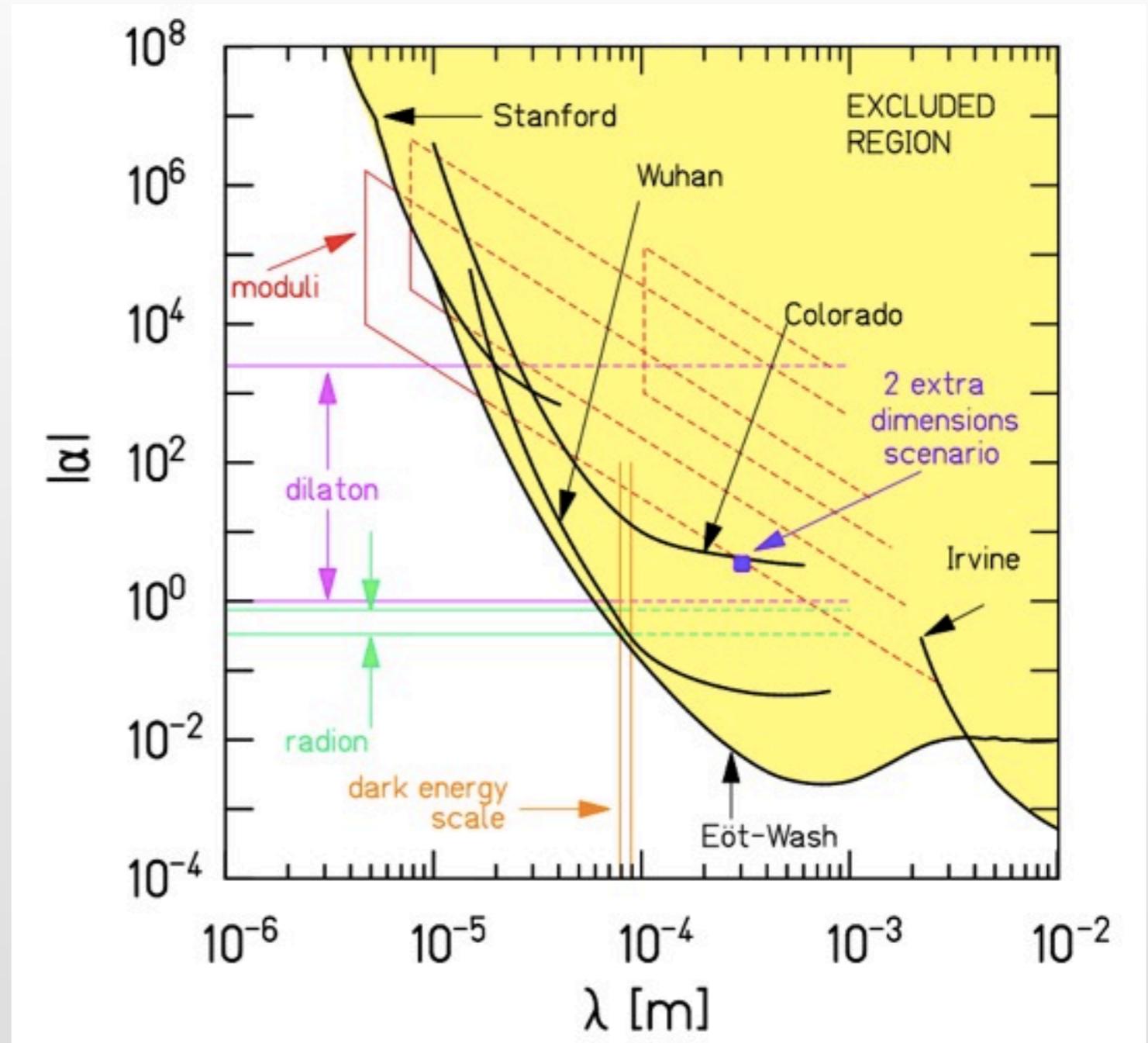
Extra Dimensions Review:

J. Parsons (Columbia)

A. Pomarol (Barcelona)

Review cites 20 ATLAS and CMS papers from 2010-2011!

(in addition to Tevatron, LEP, others)



2012 Responsible: Jean-Francois Arguin (LBNL -> Montreal)

Some results appear in multiple sections – we should continue to examine this overlap (e.g. Higgs, Other Heavy Bosons, Axions) and include model-independent searches.

Reviews can be further updated for LHC data (e.g. Compositeness Review last updated in 2001, while listings contain new LHC papers)

PDG helps set the benchmarks for these searches, continue good interactions with Higgs, SUSY, Exotics/Exotica groups to facilitate ease of use, best comparisons for limits

First chance to deal with a discovery at the LHC – succeeded in getting important results in under time pressure.

In the case of a more difficult to interpret state, could add a short separate review to address the new particle/anomaly, from discovery to interpretation.

Hopefully there will be many more chances!